



An influence diagram for urban flood risk assessment through pluvial flood hazards under non-stationary conditions

Åström, Helena Lisa Alexandra; Friis Hansen, P.; Garré, L.; Arnbjerg-Nielsen, Karsten

Published in:

Abstract proceedings 7th Annual Meeting Danish Water Research and Innovation Platform (DWRIP) – Forsknings- og Innovationsplatformen Vand

Publication date:

2013

Document Version

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Åström, H. L. A., Friis Hansen, P., Garré, L., & Arnbjerg-Nielsen, K. (2013). An influence diagram for urban flood risk assessment through pluvial flood hazards under non-stationary conditions. In B. K. Jensen, & N. Levysøhn (Eds.), *Abstract proceedings 7th Annual Meeting Danish Water Research and Innovation Platform (DWRIP) – Forsknings- og Innovationsplatformen Vand* (pp. 21). The Danish Water Research and Innovation Platform.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Abstract proceedings

7th Annual Meeting Danish Water Research and Innovation Platform (DWRIP) – Forsknings- og Innovationsplatformen Vand

Technical University of Denmark
Building 308
DK-2800 Lyngby

31 January 2013

Edited by B.K. Jensen and N. Levysohn

List of contents

	Page
Session 2: Research and development in low- and middle income countries	3
<i>P.E. Holm: Water and Environment theme, Sino-Danish Center for Education and Research (SDC), Beijing</i>	3
<i>L.F. Jørgensen and H. Dissing: China Europe Water Platform (CEWP)</i>	4
<i>S. Stisen et al.: Hydrological modelling for climate change and water management impact assessment in data sparse regions</i>	5
<i>M. Chongo et al. Geophysical and geochemical characterisation of groundwater resources in Western Zambia</i>	6
<i>M. J. Calopietro et al.: SUSA Ghana – A multi-disciplinary research project on sustainable sanitation in peri-urban Ghana</i>	7
<i>F. Plauborg et al.: Growth, yield and WUE of drip and sprinkler irrigated okra grown on sandy soil under semi-arid conditions in Southeast Ghana</i>	8
Session 3: Water and health	9
<i>C. Jørgensen: Water and Health – Challenges in Denmark today</i>	9
<i>S.M. Kristiansen et al.: Iodine in Danish ground and drinking water – preliminary speciation results and design of a nationwide sampling campaign</i>	10
<i>A. Forslund et al.: E. coli contamination and health aspect associated with the use of on-site treated wastewater and canal water for irrigation of potatoes and tomatoes</i>	11
<i>A. Erichsen et al.: Bathing water: Risk, solutions, and monitoring. Case: Ironmen swimming in diluted wastewater</i>	12
<i>J. Clauson-Kaas: Flooding and health risks - What will Greater Copenhagen Water Company do?</i>	13
<i>H.-J. Albrechtsen: Drinking water – Risks, solutions, and monitoring. Case: Nørrebro</i>	14

An influence diagram for urban flood risk assessment through pluvial flood hazards under non-stationary conditions

H.L.A. Åström, DTU Environment, P. Friis Hansen, Det Norske Veritas**, L. Garré, Det Norske Veritas***, K. Arnbjerg-Nielsen*****

Abstract

Urban flooding introduces significant risk to society. Extreme flood events can grow into national threats if timely adaptation and protection measures are not implemented. More information is needed to understand climate change impacts and other non-stationary conditions for development of suitable adaptation strategies at a regional scale.

Infrastructures are important assets in urban environments and their continuous operation is crucial to society. Urban infrastructures have a long technical lifetime. For example the technical lifetime for drainage systems is often assumed to be 100 years. On these time scales the effects of climate change will be statistically evident; because of this, adaptation of long-lived infrastructures should be investigated well ahead of their construction.

Decision-makers need to agree on how to adapt urban areas to flooding. However, non-stationarity leads to increased uncertainty and this is shown to be difficult to include into actual decision-making. Transparent methods are needed to facilitate the decision-making process. While decision-makers can gain an understanding of future climatic changes through scenarios and projections there is still a considerable knowledge gap between different projections and actual decision-making based on these projections. The large uncertainties introduced by future projections can lead to aversion in making a decision and investing in adaptation to floods.

The primary objective of this study was to develop a risk assessment and decision support framework for pluvial urban flood risk under non-stationary conditions using an Influence diagram (ID). Non-stationarity is considered to be the influence of climate change where extreme precipitation patterns change over time. The overall risk is quantified in monetary terms expressed as expected annual damage (EAD). The network is dynamic inasmuch as it assesses risk at different points in time to evaluate the non-stationarity in the urban system. The framework provides a means for decision-makers to assess how different decisions on flood adaptation affect the risk now and in the future. For the development of the ID we used the HUGIN software. The result from the ID was extended with a cost-benefit analysis defining the net benefits for the investment plans. We tested our framework in a case study where the risk for flooding was assessed on a railway track in Risskov (Aarhus). Drainage system improvements are planned for the area and our case study presents how the developed BN illustrates the increase in risk over time and the decrease in risk due to the planned improvement.

**(hlaa@env.dtu.dk): DK-2800 Lyngby, Denmark,*

*** (peter.friis.hansen@dnv.com): 1322 Høvik, Norway*

**** (luca.garre@dnv.com): 1322 Høvik, Norway*

***** (karn@env.dtu.dk): DK-2800 Lyngby, Denmark,*